Weather Observations for Aircraft Ground Deicing and Anti-icing Operations by Airlines

Federal Aviation Administration

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Weather Observations for Aircraft Ground Deicing and Anti-icing

- **Overview of weather observations needed for aircraft ground deicing and anti-icing operations by airlines**
  - Aircraft, not airport
  - Decisions as to type and dilution of anti-icing fluid used and takeoff decisions based on allowance and holdover times.
- **Four-Dimensional Weather Data Cube: SINGLE AUTHORITATIVE SOURCE (SAS): Final Performance Requirements (fPR), Version 1.0, September 30, 2009.**
  - Executive Summary
  - Appendix B – JPDO 4-D Weather Functional Requirements for NextGen ATM.
  - Appendix C – SAS Functional and Performance Criteria Tables.
  - Appendix D – Performance Requirements for Observe Atmospheric and Space Conditions for Super Density Terminals Airspace.

Holdover Times and Allowance Times

- **Flight crews depend on tables to determine allowance and holdover times in operations.**
- **Information on the intensity of the freezing or frozen precipitation is necessary to use many of the cells in these tables.**
- **The intensity can have a large effect of the holdover time or allowance time.**
- **Example. Snow at 25 deg F. Undiluted Type IV fluid**
  - Light snow: Holdover Time = 40 minutes
  - Moderate snow: Holdover Time = 20 minutes
- **Example. Ice pellets at 25 deg F. Undiluted Type IV fluid**
  - Light ice pellets: Allowance Time = 30 minutes
  - Moderate ice pellets: Allowance Time = 10 minutes
- **There are no allowance or holdover times for heavy snow, moderate or heavy freezing rain.**

Weather phenomena for aircraft ground de- and anti-icing

NEEDED

- **Snow, Freezing Rain, Freezing Drizzle, Ice Pellets, Supercooled Fog, Frost**

NOT NEEDED

- **Appendix D, 148-152 Location of ice crystals at surface of super-density terminal airspace (SDTA) with horizontal accuracy (HA) of 0.25 km.**
- **Appendix D, 176-178 Location of snow grains at the surface of SDTA with HA of 0.25 km.**
- **Appendix D, 213-220 Location of snow pellets at the surface of SDTA with HA of 0.25 km.**
- **Ice Fog – No observation requirements for ice fog, but there are forecast requirements (Appendix E)**

Need to provide liquid water equivalent (LWE) rates for freezing and frozen precipitation in operations

- **Holdover times are based on endurance time testing.**
  - Regression curves of time versus LWE rate are determined from the test results.
  - Using the curves, the LWE rates are then translated into intensities which are the basis for the times in many of the cells.
- **In operations, snow intensity and drizzle intensity are based upon visibility.**
  - Not well correlated with LWE rates for this purpose.
- **If LWE rates were available operationally, intensities could be based on them, resulting in more accurate use of the HOT tables.**
- **Even better, the regression curves could be automated to determine holdover times much more precisely.**
- **Example**
  - 1 mm/h is light-to-moderate threshold for snow
  - 2.5 mm/h the moderate to heavy threshold for snow.
  - In the construction of the tables, any rate in the range from 1 mm/h to 2.5 mm/h is labeled as moderate.
  - With the LWE rates available operationally, the regression curves determined during the testing could automated; for example, if the LWE rate were 1.5 mm/h, the HOT would be determined for that rate. This would do away with the tables altogether. Certainly this should be a goal for the NexGen of 2025, if not before.

Need to provide liquid water equivalent (LWE) rates for freezing and frozen precipitation in operations (cont)

- **Appendix D, 142 Calculate the water equivalent of snowfall accumulation at the surface of SDTA**
  - 1-hour periods
  - accuracy of 0.05 inches.
- **Appendix D, 143 Calculate the water equivalent of snowfall accumulation at the surface of SDTA**
  - 3-hour periods
  - accuracy of 0.1 inches.
- **For ground icing operations,**
  - LWE is needed at least every five minutes
  - LWE is needed for freezing drizzle and in fact all forms of frozen or freezing precipitation

Need to provide LWE rates in the vicinity of the deicing/anti-icing pad and the takeoff runway

- **Observational performance requirements for Super Density Terminal Airspace are stated in Appendix C as**
  - horizontal resolution of 0.5 km
  - horizontal accuracy of 0.25 km
- **These requirements only need to be met in certain areas of the terminal airspace (which extends out to 60 km), mainly in the vicinity of the deicing/anti-icing pad and the takeoff runway.**
  - Depending on the airport, this could require locations at several locations, but not throughout the entire terminal area.